59 Cigarette smoking and platelets

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To assess the long-term effects of smoking on platelet-vessel wall interaction and platelet function we studied ten identical male twin pairs (mean age 40 years, range 31-53) discordant for smoking (average 18 cigarettes/day, range 5-32) for over 20 years.

In a duplex-ultrasound study the smoking cotwins had significant signs of carotid atherosclerosis, the area of plaques being 6.5 mm^2 vs 1.9 mm^2 of nonsmoking ones (mean paired difference 0.9-8.3, 95% confidence interval). The urinary excretion of 2,3-dinor metabolites of thromboxane A_2 (Tx-M) was increased in smokers in each pair: 480±68 (mean ±SEM) vs. 263±27 pg/creatinine mg in nonsmokers. Also, PGI-M was increased in smoking cotwins, 132±20 vs. 100±14 pg/creatinine mg in nonsmokers. The ratio between Tx-M and PGI-M was higher in smokers. Both packyears (r=0.83) and cotinine excretion (r=0.67) correlated with the urinary Tx-M in smokers.

Plasma fibrinogen was 3.0±0.1 g/l for nonsmokers and 3.3±0.2 g/l for smokers and hematocrit was 45±1 and 47±1, respectively. Added up these values imply that smoking elevates plasma viscosity ($p<0.01$). Platelet aggregation in vitro, and subsequent release of TxB_2 and serotonin did not differ at rest. However, after submaximal exercise smokers' platelets turned markedly refractory to agonist stimulation and the production of serum TxB_2 was reduced. Simultaneously, the α_2-adrenoceptor binding and prostacyclin responsiveness of adrenaline-stimulated platelets remained unaltered.

Our findings with these unique study subjects show that long-term cigarette smoking promotes progression of atherosclerosis and signs of increased platelet-vessel wall interaction. The reduced platelet responsiveness after exercise supports in vivo activation of platelets. In favor of enhanced risk of thrombogenesis are the increased levels of the contributors of plasma viscosity. Our study provides evidence that smoking-induced effects on platelets are both direct and indirect via enhanced arterial plaque formation.